Technical Standards for Broadband Wireless Access

January 21, 1999

Dr. Roger B. Marks

National Institute of Standards and Technology
Boulder, Colorado

N-WEST

Distinguished Microwave Lecturer

IEEE Microwave Theory and Techniques Society

Headline

Technical Standards are coming to the Broadband Wireless Access Industry!

N-WEST is:

- the National Wireless Electronic Systems Testbed
- an effort by the U.S. Department of Commerce to accelerate development of the broadband wireless industry by encouraging voluntary standards
- a coordinated project of NIST and the National Telecommunications & Information Administration (NTIA)
- a measurement testbed at the Boulder Labs of NIST & NTIA: applying unbiased measurements to help forge industry consensus standards and specifications
- closely tied to industry (advice, equipment, personnel, . . .)
- on the Web at http://nwest.nist.gov

Wireless Standards in the United States

- FCC no longer regulates standards for wireless communications (spectrum auctions since 1994)
- no coordinated U.S. approach to wireless standardization
- standardization in newly-auctioned spectrum is slow
- multiple standards continue indefinitely
- equipment costs remain high
- for new services, licensees and vendors may hesitate

N-WEST Philosophy

Goal:

Accelerated Commercialization of Broadband Wireless Access Systems

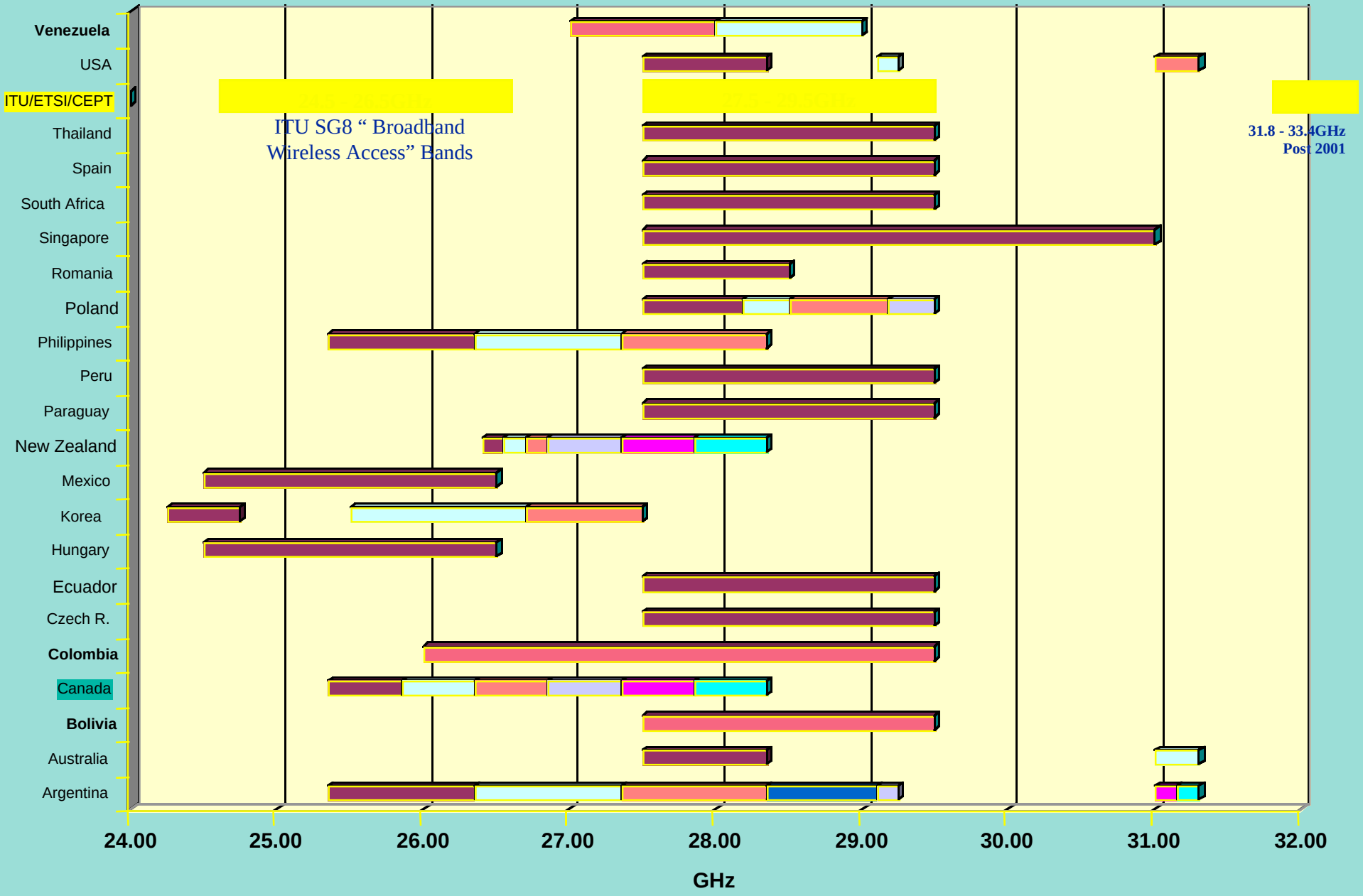
Mechanism:

- ➥ equipment cost reduction (esp. at customer end)
  - ➥ mass production
    - ➥ standardization
      - ➥ voluntary industry standards bodies (IEEE)
        - ➥ unbiased measurement support (NIST and NTIA)

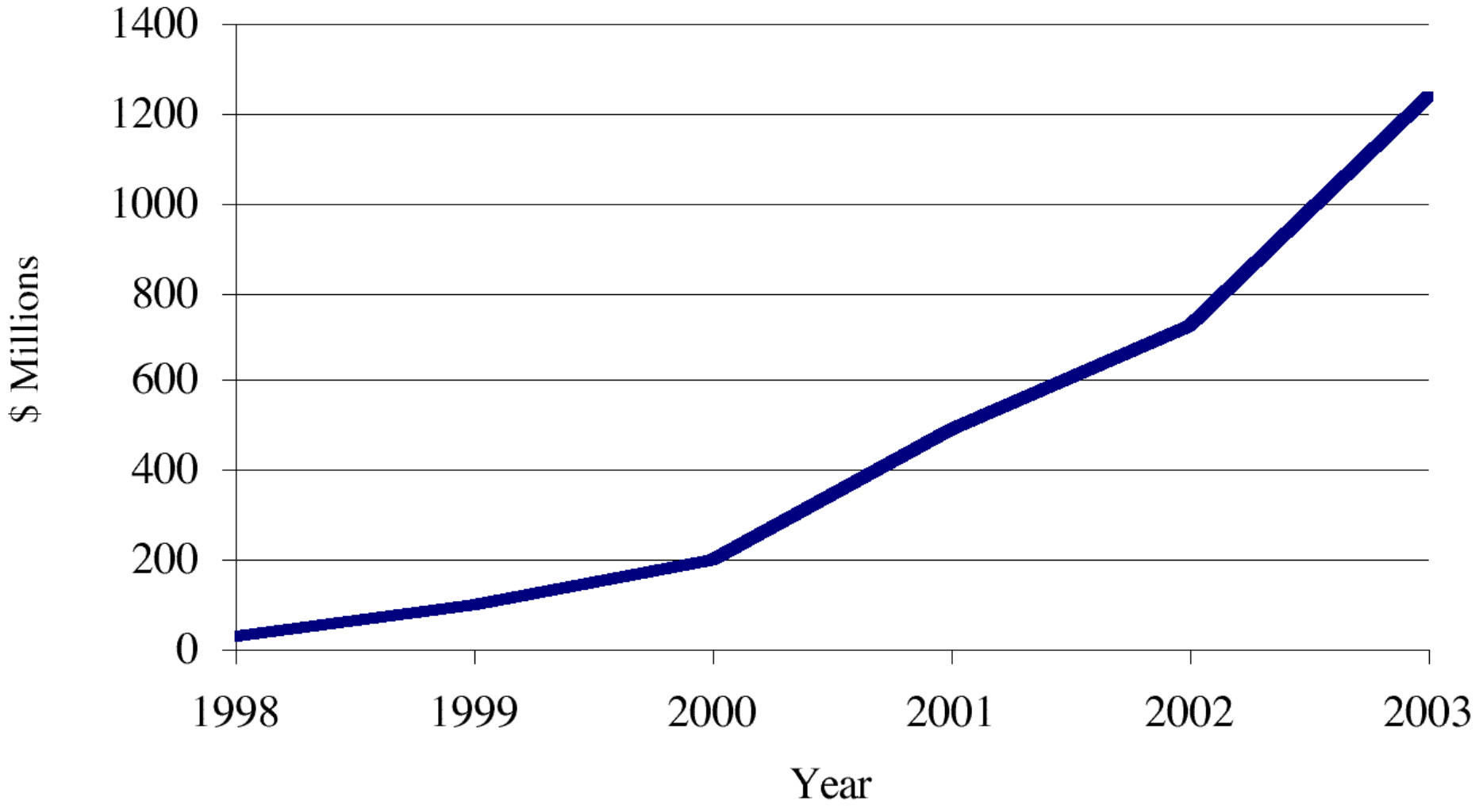
➥provide broadband access to more Americans

➥promote U.S. technical standards abroad

LMDS Spectrum Worldwide



Shipments of Millimeter Wave Systems*, World Market, 1998
Auto Collision, LMDS, Satellite



Source: Allied Business Intelligence, Inc.

*Point-to-Point Microwave not included

Business Case for Broadband Wireless Standards

"Subassembly and chip manufacturers simply cannot supply the performance that millimeter wave system manufacturers desire at a price which is feasible for significant penetration into the consumer market today."

"LMDS may be closest to achieving this goal, but its *lack of a unified standard and lack of commitment to significant volumes will inhibit further price declines*."

- "Millimeter Wave 1998: Broadband Wireless and Automotive Radar Markets, Opportunities & Forecasts," Allied Business Intelligence (quotes from August 11, 1998 press release)

N-WEST History in Brief

- April 3, 1998
  - N–WEST Web Site went on–line (http://nwest.nist.gov)
- July 24, 1998
  - Strategy Session attended by 10 people in Boulder
- August 9-10, 1998
  - Kickoff Meeting attended by 45 people
- August 9-12, 1998
  - 1998 IEEE Radio and Wireless Conference (RAWCON'98) attended by 300 people
- November 9-10, 1998
  - Second meeting, at 802 Plenary (41 people)
  - 802 approved Executive Committee Study Group on BWA
- January 13-15, 1999
  - First Study Group meeting (66 people)

53 N-WEST Supporting Companies

- **Industry Associations**
  - Cellular Telephone Industry Assn.
  - Wireless Communications Assn.
- **License Holders**
  - Antilles Wireless Cable TV Co.
  - Charles Brinkman
  - Formus Communications, Inc.
  - US WEST Adv. Technologies
  - WinStar Communications, Inc.
  - WNP Communications, Inc.
- **Systems Equipment Providers**
  - 3Com Corporation
  - ADC Telecommunications
  - Alcatel Network Systems
  - Belstar Systems Corp.
  - Ensemble Communications
  - Ericsson Inc.
  - Intraplex
  - Lucent Technologies
  - Motorola Inc.
  - NEC America, Inc.
  - Netro Corpopration
  - Nortel Networks
  - P–COM
  - Philips Broadband Networks
  - Spike Technologies, Inc.
  - WaveCom Electronics Inc.
  - WaveSpan Corporation
  - Wavtrace
- **Subsystems and Components**
  - AMP M/A–COM
  - Andrew Corp.
  - BroadBand Wireless Inc.
  - CircuitPath Network Systems
  - ETM Electromatic
  - Hewlett-Packard Co.
  - IDT Inc.
  - Integrity Communications
  - Millitech Corporation
  - Raychem Corp.
  - Raytheon Systems Company
  - SiCOM, Inc.
  - Stanford Wireless Broadband Inc.
- **RF Semiconductors**
  - Fujitsu Compound Semiconductor
  - Harris Semiconductor
  - Sanders, A Lockheed Martin Co.
- **Test and Measurement**
  - Anritsu Company
- **Consultants/R&D/Misc.**
  - Bellcore
  - C&W Systems, Ltd.
  - E B Systems Limited
  - EDX Engineering, Inc.
  - Hardin & Associates, Inc.
  - Illinois Institute of Technology
  - LCC International Inc.
  - MLJ, Inc.
  - Technical Strategy Associates
  - WFI

CMP

ELECTRONIC ENGINEERING

EE TIMES

Issue 1021 www.eet.com The industry newspaper for engineers and technical management Monday August 17, 1998

Wireless camps' goal: affordable systems

Open-systems push sweeps broadband

By Loring Wirbel

COLORADO SPRINGS, COLO. – Hustling to infuse life into a market perceived as pricey and arcane, proponents of broadband wireless services came to the IEEE Radio & Wireless Conference (Raweon) last week with strategies for pushing standardization and, by extension, lower-cost, more-accessible systems.

N-West's Marks: Nod for NIST as 'facilitator.'

Proponents of millimeter-wave broadband systems are still smarting from the lukewarm response to the FCC's 28-GHz auctions, which raised a less-than-stellar $570 million from a smaller-than-expected pool of carriers. In a lunch address at Raweon, National Telecommunication & Information Administration head Larry Irving told local multipoint distribution service (LMDS) developers that they are perhaps the last great hope for "last-mile" broadband services. But much is riding on their ability to get the cost out of their systems.

"I have seven separate wireless systems in my household, but I'm still stuck with 56k in my wireline service," Irving said. "If we had 'calling party pays,' I'd give up my wireline phone completely tomorrow, because you guys will be giving me broadband data service a lot faster than my wireline phone company."

A new report from Allied Business Intelligence (Oyster Bay, N.Y.) states that the mul-

▸CONTINUED ON PAGE 126

EE Times Report on N-WEST

"Proponents of broadband wireless services came to RAWCON'98 last week with strategies for pushing standardization and, by extention, lower-cost, more accessible systems."

- "Open–Systems Push Sweeps Broadband," *Electronic Engineering Times*, August 17, 1998, Page 1

License Holder's View

[In his RAWCON'98 Keynote Address, Barclay Jones, Chief Technical Consultant of WNP Communications]

"cited the work of the recently formed National Wireless Electronic Systems Testbed and said that far more standards to drive interoperability need to be developed in LMDS services."

- *EE Times Online*, August 13, 1998

Industry Association View

"It's a very important initiative by the Commerce Department to help jump–start this industry. It's helpful to have a neutral party for manufacturers to be willing to share confidential information."

- Andrew Kreig, President, Wireless Communications Association (over 250 member companies in fixed wireless), quoted in "Wireless Technology Catches New Waves," *Rocky Mountain News*, August 17, 1998, Page B1

U.S. Federal Government View

"Certain costs, such as the cost of terminal equipment, may still prevent some wireless services from being used on a broad scale. We need to figure out how to lower these costs to make wireless technology more widely available. That is why I think the work of N-WEST is so important... Collaboration within the industry could help lower the cost of user terminals and, I hope, make broadband wireless an accessible alternative for more Americans."

- Larry Irving, Assistant Secretary for Communications and Information, U.S. Department of Commerce, August 10, 1998 (RAWCON'98 Banquet Address: "The Next Waves In Wireless Technologies")

Standardization Approach

IEEE: Institute of Electrical and Electronics Engineers

- IEEE Computer Society
  - IEEE 802: LAN/MAN Standards Committee
    - met there in November 1998
    - Study Group on Broadband Wireless Access

Proposal for

Executive Committee Study Group
on
Broadband Wireless Access

IEEE 802 Executive Committee Meeting
Albuquerque, NM
November 12, 1998

Dr. Roger B. Marks

Director

National Wireless Electronic Systems Testbed

National Institute of Standards and Technology

United States Department of Commerce

Chair, Standards Coordinating Committee

IEEE Microwave Theory and Techniques Society

Definition of Scope

The Broadband Wireless Access (BWA) networks considered are those which:

- **use wireless links with microwave or millimeter wave radios**
- **use licensed spectrum (typically)**
- **are metropolitan in scale**
- **provide public network service to fee-paying customers (typically)**
- **use a point-to-multipoint architecture with stationary rooftop or tower-mounted antennas**
- **provide efficient transport of heterogeneous traffic with QoS support**
- **are capable of broadband transmissions (>2 Mbit/s)**

This defines a project unique in 802.

Proposed Output of Study Group

(1) PAR for specification of interoperable LMDS system
("LMDS" = Local Multipoint Distribution Service)
- for March, 1999 802 approval

(2) PAR on coexistence of BWA with other RF systems and extention to other BWA frequency bands, with goal of worldwide applicability
- for July, 1999 802 approval

Schedule

November 12, 1998

- approval of Study Group

January 13-15, 1999

- interim meeting
  - with 802.11 and ETSI BRAN

February 5, 1999

- Interoperability PAR submittal to 802 Executive Committee

March 11, 1999

- Interoperability PAR approval by 802 Executive Committee

January 31, 2001

- final approval of interoperability standard

First Study Group Meeting

- last week in Orlando
- with two other groups
  - 802.11 (Wireless LANs): 100 people
  - ETSI BRAN (70 people)
  - 802.N-WEST (70 people)

802.N-WEST / HIPERACCESS Joint Session

Roger Marks, N-WEST	N-WEST Status and Plans
Aldo Bolle, Ericsson & BRAN HIPERACCESS	HIPERACCESS Status and Plans
Harold Teunissen, Lucent Technologies	BRAN HIPERLAN/2 DLC - Current Status
Naftali Chayat, BreezeCOM; Chair 802.11a	Comparison between Single Carrier and Multicarrier Approaches
Marianna Goldhammer, BreezeCOM	HIPERACCESS and 802.11 system architectures
Peter Karlsson, Telia Research AB	Technical Trial with Wireless ATM Access at 28 GHz

Study Group Members (1)

- 3Com (2)
- Alcatel USA
- AMP, Inc. (3)
- Andrew Corporation
- Angel Technologies Corp. (2)
- AT&T
- Belstar Systems Corp.
- BNA Systems
- Bosch Telecom, Inc. (2)
- BreezeCOM
- Broadband Ventures
- C&W Systems, Ltd.
- California Amplifier, Inc.
- CircuitPath Network Systems
- ComStar Communications
- Dot.Wireless
- Ensemble Communications (2)

Study Group Members (2)

- Ericsson Inc. (2)
- Eurobell
- Filtronic Solid State
- Harris Corporation (2)
- Hewlett-Packard Company
- HRL Laboratories
- Industry Canada (2)
- Integrity Communications
- Kyocera DDI Institute
- LCC International Inc.
- Logimetrics, Inc.
- Lucent Technologies (2)
- Millitech Corporation
- MMAC
- Motorola Inc. (2)
- Netro Corpopration
- Newbridge Networks Corp.

Study Group Members (3)

- NIST/N-WEST
- Nortel Networks (3)
- NTT Electronics Corp. (NEL)
- Philips Broadband Networks (2)
- Raytheon Systems Company
- SiCOM, Inc.
- Siemens Information and Communication Networks
- Stanford Wireless Broadband (2)
- Technical Strategy Associates
- Telegen Ltd.
- TRW
- WaveSpan Corporation
- Wavtrace, Inc. (2)
- WinStar
- Wireless Communications Association Intl.

Interoperability Standard

- **Title (Draft)**

Standard for Broadband Wireless Access Systems

- **Scope (Draft)**

This standard includes specifications for the air interface, including the physical layer and media access control layer, of fixed point-to-multipoint broadband wireless access systems providing multiple services operating in the vicinity of 30 GHz. These specifications will be broadly applicable to systems operating between 10 and 66 GHz.

Interoperability Standard

- **Purpose (Draft)**

To enable rapid worldwide deployment of innovative, cost-effective, and interoperable multivendor broadband wireless access products. To facilitate competition in broadband access by providing alternatives to wireline broadband access. To facilitate coexistence studies, encourage consistent worldwide allocation, and accelerate the commercialization of broadband wireless access spectrum.

Study Group Organization

- Chair
  - Roger Marks, NIST/N-WEST
- Secretary
  - Scott Marin, Bosch Telecom
- ETSI BRAN Liaison
  - Paul Khanna, Hewlett-Packard
- Coexistence Task Group
  - Leland Langston, Raytheon
- System Requirements Task Group
  - Gene Robinson, Angel Technologies
- Media Access Control Task Group
  - Jim Mollenauer, Tech. Strategy Assoc.
- Physical Layer Task Group
  - Jay Klein, Ensemble Communications

Find Out More

see

http://nwest.nist.gov

join

N-WEST Mailing List